

Planting to Protect: Can Forest Plantations Alleviate Pressures on Natural Forests?

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A summary of EEPSEA Research Report 2002-RR1, Can Tree Plantations Alleviate Pressures on Natural Rainforests? An Efficiency Analysis in Indonesia, by Bambang Tri Hartono (College of Forest Resources, North Carolina State University, Box 8002 Raleigh, NC, USA; contact: steeh@mindspring.com)

One potential method for reducing tropical forest destruction is the creation of environmentally-sustainable plantations that can supply wood and paper pulp products and so reduce demand for timber from virgin forests. Whether plantations meet this objective depends in part on how well they perform in planting trees and bringing them to maturity. A new study from Indonesia has investigated the factors that affect the efficiency of plantation development efforts. The study finds that medium- and large-scale plantations linked with paper pulp schemes had the best performance. It argues that this has a number of important policy implications, including the need to provide smaller plantations with the kind of services and connections their larger competitors enjoy by virtue of their size.

Investigating Plantation Efficiency

Bambang Tri Hartono carried out the study as part of his PhD studies at the College of Forest Resources, North Carolina State University, USA. Thirty-two plantation companies involved in the timber and pulp and plantation program were examined in his survey of East Kalimantan, South Kalimantan, South Sumatra, and Riau. These four provinces are among the leading areas for timber and pulp plantation development in Indonesia.

Using computer analysis, Hartono investigated data from the companies' activity records over four years, as well as the results of questionnaires about the companies' characteristics. He analyzed various factors such as the size of the plantations and companies; the type of firm (state-owned, transmigrant, pulp, or non-pulp); the number and technical expertise of workers; the type of mechanized equipment used; and the financing mechanism employed. (Some plantation receive government financing; others are entirely self-financed).

He then calculated how far each firm's level of output was from that of a theoretical 100% technically efficient firm. He expressed the technical efficiency of each firm as the ratio of its observed output to the potentially attainable 'frontier' output.

Responding to Deforestation

The study was conducted against a background of continued forest destruction in Indonesia. One of the contributing factors is that the country's plantations cannot yet support its forest-based industries, which have expanded seven-fold in the last decade and are still dependent on the country's natural forest resource for most of their raw material.

It is well known that the country's plantations are under-performing: At the end of 1999, only 24% of the total land allocation for timber and pulp plantations (7.4 million hectares) had been planted. Moreover, planting performance has substantially declined after the economic and political crisis in 1997. To make matters worse, timber and pulp plantation companies also face major economic and environmental hurdles including unstable prices, frequent and large-scale forest fires, large debts and the preference of the private sector for agricultural crops which give better returns.

Inefficiencies Abound

Hartono found that considerable technical inefficiencies exist in the industrial timber and pulp plantation companies he sampled. Although their estimated technical efficiencies of the plantation firms varied widely (ranging from 0.12 to 0.93, with a mean value of about 0.60) overall he found that less than 20% of companies had achieved a satisfactory planting performance.

The main factors affecting efficiency were found to be the scale of each company, the nature of the plantation schemes, and the involvement of local people. In general, he found that large companies tended to have higher efficiency scores than medium- and small-scale companies. He also found that operations employing a greater proportion of local people tended to be more inefficient. Pulp and non-pulp schemes had better efficiency scores than self-financed, transmigration schemes and state-owned schemes. Of these latter types, the self-financed schemes had the lowest technical efficiency scores.

Why Inefficiencies Occur

Hartono investigated possible reasons for these results. He found that various characteristics of large companies had a significant positive effect on efficiency. These included the use of heavy mechanized plant and integration with holding companies such as timber concessionaries. In general, Hartono noted that larger companies could capitalize on economies of scale and generally had better planting research, development and implementation.

Hartono attributed the effect of local labour to the fact that many local workers are casual labourers who move in and out of jobs rapidly and take time off to undertake subsistence agriculture. Employers therefore make little effort to improve their skills through training. Interestingly, and contrary to expectations, Hartono found that the amount of skilled labour and technicians in a firm had little effect on efficiency. He attributed this to the hierarchical management style of many plantation companies, in which the expertise of skilled workers is not fully utilized.

The poor performance of self-financed concerns may reflect the fact that they are not well-equipped to make long-term commitments to a plantation program. Limited budgets, the use of unimproved seed and lack of equipment all contribute to poor performance.

In contrast, he found that the pulp companies are more advanced in research and development, in tree improvement techniques and in the use of technology. He also found that they have a more secure market for their products than the other schemes.

Is Carbon Sequestration an Answer?

Hartono also investigated the contribution of tree plantations to carbon sequestration. Since the Kyoto Protocol of December 1997, the potential for financing afforestation through trading carbon credits has been high on the world development agenda. Some estimates have put the carbon storage value of Malaysian forests as high as USD 3,682 per hectare.

The plantations Hartono studied were found to absorb between 5.72 and 8.47 tC ha./yr. - less than other studies predict. Hartono attributed this partly to the fact that the smaller companies surveyed had poor technical expertise and were using low-grade seed stock. This suggests the larger, better-established plantations will be in a better position to earn revenues from carbon trading than the small fry.

What Should Be Done?

The large differences in performance across firms shows that there is great potential for improving the efficiency of Indonesia's timber plantations. The challenge for the Indonesian government is to achieve this in ways that do not jeopardize the livelihoods of poor people or result in a more unequal distribution of income opportunities. Hartono's study shows that the highest rates of efficiency are found in large firms with vertically integrated operations. Breaking up such operations and redistributing their assets to smallholders is likely to result in very low levels of efficiency, with negative effects on forest exploitation and on Indonesia's competitiveness as a supplier of wood products.

One way out of this dilemma would be to establish nucleus-estate or outgrower schemes. In these, smallholders undertake cultivation of trees (or other crops) while a central authority - either public or private - is responsible for such functions as collection of output from the producers, provision of seeds and inputs, technical assistance, and processing and marketing of the final product. Such schemes have been used successfully in many crops and in many countries, the most relevant example being Malaysia's outgrower schemes in oil palm. These have produced high incomes for their participants and high levels of efficiency. These combined to make Malaysia one of the world's most successful exporters of palm oil.

Whatever methods are used to improve the efficiency of timber plantations, they are unlikely to be effective if plantations continue to compete with an extremely low cost of timber extraction from natural forests. Current policies do not recognize the benefits provided by natural forests so trees from them are not priced at their full value to society. Hartono recommends higher reforestation fees and more stringent forest management practices to put plantations and natural forests on a more level playing field.